MAMMOTH TRUMPET

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Center for the Study of the First Americans
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Pretending to Be Obese

JOCELYN ECKERMAN

That garment high school physics student Cassie Eckerman is wearing is called a weight apron. Big pockets, when stuffed with bags of dried beans or rice, give her a good idea of what it would be like to have to carry extra pounds of fat on her body all day long. It was invented by middle school teachers in Texas, themselves students of Carolyn Marshall at the Department of Medicine at the University of Texas Health Science Center in San Antonio, as a weapon to use in their battle against the epidemic of obesity and attendant diseases, especially diabetes, that is ravaging Cassie's Hispanic and Native American classmates. The causes of the onslaught of obesity in the Southwest? Lifestyle changes and a suspected culprit called the Thrifty Gene. The solution? Encourage children to eat right and exercise regularly. To learn more about Dr. Marshall and the war against obesity and diabetes, read her story on page 13.

The Center for the Study of the First Americans fosters research and public interest in the Peopling of the Americas. The **Center,** an integral part of the Department of Anthropology at **Texas A&M University,** promotes interdisciplinary scholarly dialogue among physical, geological, biological and social scientists. The **Mammoth Trumpet**, news magazine of the **Center,** seeks to involve you in the peopling of the Americas by reporting on developments in all pertinent areas of knowledge.

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A&M professor earns 'Rip Rapp' award

Avid archaeologist and Texas A&M anthropology professor Dr. Michael Waters received a nod from the Geological Society of America. The organization awarded Waters with the "Rip Rapp Archaeological Geology Award" which recognizes Waters' outstanding continued contribution to the interdisciplinary field of archaeological geology.

The award is named for archaeological geology pioneer George "Rip" Rapp. Rapp was the primary individual responsible for bringing the Archaeological Geology Division to the GSA.

Waters is also the associate director for the Center for the Study of the First Americans and author of the avidly used geoarchaeology text "The Principles of Geoarchaeology: A North American Perspective," which he wrote in 1992. Waters has traveled across the globe to participate in several archaeological field projects in Yemen, Jamaica, Russia and Mexico.

DARYL P. MILLER (SCIAA—USC)

Waters at the Topper site in South Carolina, June 2000

For the layman, Waters describes the field of geoarchaeology as the field for applying geosciences and archaeological research questions. Waters' research involves investigating late prehistoric archaeological sites and relating them to the changes in landscape to discover the origins of the first Americans.

After receiving his doctorate in geosciences from the University of Arizona, Waters received several grants from the National Science Foundation and the National Geographic Society to fund his research in geoarchaeology, the field in which he is known for his expertise.

"Because of the accumulated contributions to the field of geoarchaeology, I have received this award," Waters said. "I am pleased and honored to receive this award."

David Carlson, associate professor and head of the Anthropology Department, believes that this award is well-deserved. "Mike has been doing exceptional archaeological investigation for 10 to 15 years."

"The award certainly draws atten-

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INSIDE

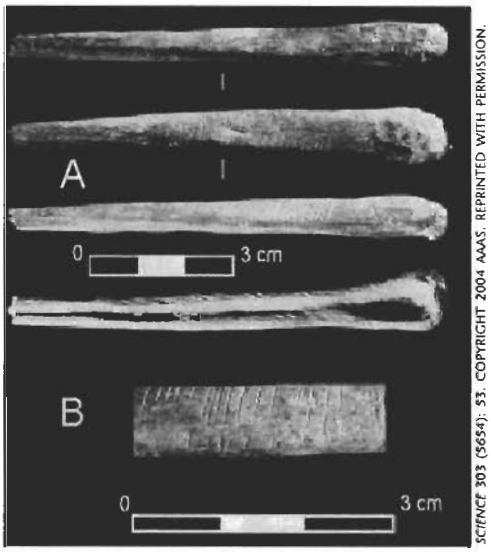
Yana River, Siberia

Implications for the Peopling of the Americas

Part II
The Implications

ALTHOUGH MOST scientific breakthroughs result from hard, steady work, many disciplines also benefit from serendipity—the dazzling insight, the accidental find, the astounding coincidence. Consider Fleming's discovery of penicillin, Kukele's dream of the benzene ring, or Courtenay-Latimer's good fortune to spot a coelacanth in a pile of dead fish. Archaeology can claim its fair share of serendipitous discoveries. One of these is a recent find that has yielded new information that must be taken into account by specialists seeking to explain the initial peopling of the Americas.

In 1993, while working in the northern reaches of the Yana River in northeastern Siberia, Russian geologist Mikhail Dashtzeren happened upon an exquisite artifact, an ivory dart foreshaft with beveled ends, crafted from the horn of an extinct rhinoceros. Radiocarbon dating pinpointed its age at 27,000 RCYBP, placing humans in the Arctic almost twice as early as previously thought. Later, Dashtzeren led archaeologist Vladimir Pitulko and a multidisciplinary team of researchers to the location of the find, where they immediately struck archaeological gold: an enormous site, 1.5 km long, littered with animal bones and ancient tools. Among their most significant finds were bone and ivory artifacts that dated as early as 28,300 ± 300 RCYBP, accompanied by unmodified faunal material up to 37,000 years old. Most of the remains were from reindeer, but Pleistocene mammoth, lion, bear, horse, rhino, and birds were also represented. After spending the 2001 and 2002 seasons studying the locality, which they named the Yana Rhino Horn site (Yana RHS), the team published its preliminary findings in the 2 January 2004 issue of *Science*.



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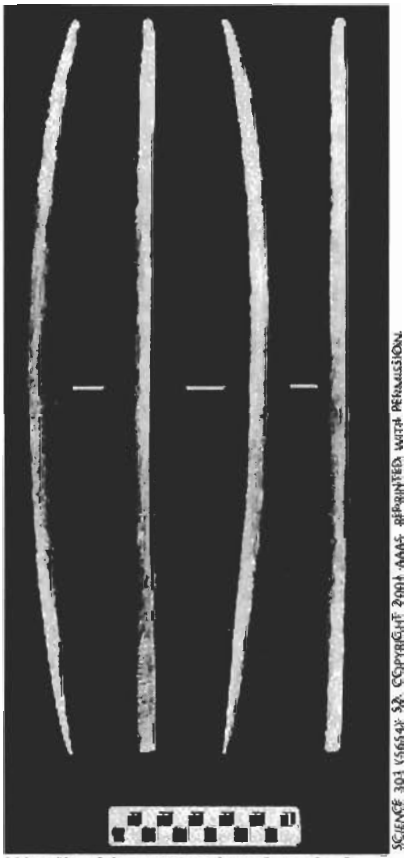
A, wolf metatarsal bone awl from Yana River RHS; B, close-up of the cutmarks on the medial portion of the metatarsal.

These discoveries, along with the geoarchaeological background of Yana RHS and the conceptual and theoretical framework surrounding the finds, were treated in the first part of this article, last issue's "The Siberian Connection." This segment deals with the archaeological, geographical, and social implications of the find, which are legion.

"About as far north as you can get"

The Arctic Circle begins at latitude 66.5° N; Yana RHS lies at 71° N, a good 300 km to the north. In a recent BBC news article, the Smithsonian Institution's Dennis Stanford characterized the region as "about as far north as you can get." Before Yana RHS, the earliest confirmed evidence of human occupation of the Siberian Arctic came from Berelekh, a Dyuktai culture site located at 70° N that dates from just 13,000–14,000 RCYBP. But with the finds at Yana River, quite a bit farther to the north, the time depth of human history in Siberia was effectively doubled in one fell swoop, from 15,000 to 30,000 years.

Some researchers, like Olga Soffer of the University of Illinois, don't find this particularly compelling; as she puts it, "Yes, they got that far north once or twice



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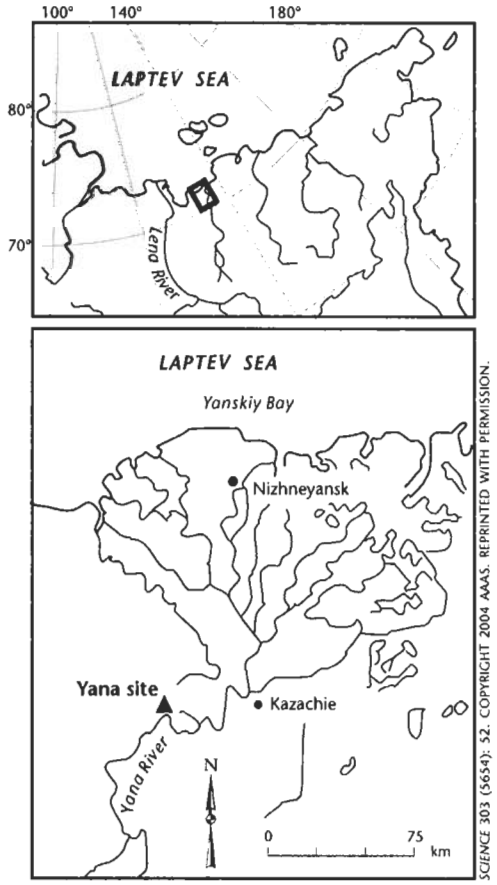
Woolly rhinoceros dart foreshaft recovered by Dashtzeren in 1993.

about 27,000 years ago. In Europe they got very far north 36,000–38,000 years ago. So?" The fact is, Arctic Siberia—then as now—was one of the coldest places on Earth, far colder than the contemporary European Arctic. According to the University of Colorado's John Hoffecker, who studies human adaptations to cold Quaternary environments,



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Location of the Yana River RHS site.

"The Yana RHS site is significant *not* because it's a 27,000-year-old site in Siberia, but because it's a 27,000-year-old site that is well above latitude 60° N and is east of the Lena River Basin." Even today, during a relatively warm interglacial period, it's almost impossible for humans to survive in the region without modern equipment. How were hunter-gatherers with a limited Paleolithic technology able to pull it off 30,000 years ago?

Simply put, they used the one tool that has allowed humans to adapt to nearly every environment on and near the planet: our infinitely variable material culture. Despite a scarcity of firmly preserved physical evidence at Yana RHS, it's clear that our Pleistocene ancestors were old hands at dealing with the bugbear of Arctic cold. "Even in the early Upper Paleolithic, the degree of human adaptation to harsh environmental conditions was quite high," points out Yaroslav Kuzmin, of Vladivostok's Pacific Institute of Geography. "A human presence in high Siberian Arctic circa 27,000 years ago is important for our understanding of that."

Although the precise nature of that adaptation remains uncertain, two things would have been absolutely necessary for human survival at Yana River: fire, and tailored clothing—clothing that was sewn and deliberately fitted to the human body. The role of fire is obvious; it's been keeping us warm, cooking our food, and scaring off predators since our *Homo erectus* days. As for tailored clothing, its value is that it traps human body warmth much better than loosely draped furs or textiles. Before people could conquer the Arctic, they had to learn to create relatively snug clothing that covered the entire body. So

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Mammoth Trumpet, Statement of Our Policy

Many years may pass between the time an important discovery is made and the acceptance of research results by the scientific community. To facilitate communication among all parties interested in staying abreast of breaking news in First Americans studies, the **Mammoth Trumpet,** a science news magazine, provides a forum for reporting and discussing new and potentially controversial information important to understanding the peopling of the Americas. We encourage submission of articles to the Managing Editor and letters to the Editor. Views published in the **Mammoth Trumpet** are the views of contributors, and do not reflect the views of the editor or **Center** personnel.

–Robson Bonnichsen, Director

Remembering Mort Turner 1920–2004

HE WAS A KALEIDOSCOPIC character—look at Mort Turner from a different angle and you see a new side of the man.

Readers of *Mammoth Trumpet* know Dr. Mortimer D. Turner and his wife, Joanne, for their seminal role in establishing the **Center for the Study of the First Americans** and for their energetic participation in the search for the first Americans that took them to the Mammoth Meadow site in Montana, to South America, and to China. Not so widely known, however, is the fact that before Mort indulged his childhood love of archaeology, he had already achieved worldwide fame as a polar geologist with the National Science Foundation. His research that enlarged our understanding of tectonic plates and continental drift earned him a reputation any scientist would envy. For Mort, though, fame wasn't as important as the satisfaction he got from the success of fellow workers whose projects he funded.

His interest in archaeology as a child in Greeley, Colorado, was nurtured by his grandfather (who at age 4 had arrived with the first settlers in a covered wagon). Mort's cousin, Beverly Darling, remembers their grandfather taking them on long walks around his farm to look for Indian artifacts and interesting rocks. "These long walks encouraged both of us to love the use of big words and their meanings," she recalls. "Grandad would explain what they meant. Grandad had a broad knowledge and shared it with his grandchildren."

Maps figure prominently in Mort's childhood and throughout his life. His father was a schoolteacher, and the Turners traveled widely in the summers; when they stopped for gas, Mort always picked up a new roadmap to read in the car. Joanne notes that their collection contains maps dating from the 1920s. "Our kids used them for school projects," she says, "to see how cities and towns, roads, airports, etc. had grown, disappeared and sometimes been created. . . . We always had a National Geographic large world map on the dining room wall—it was good

Mort Remembered

MY FIRST and one of my last memories of Mort were of the master teacher reading the landscape like a book.

The first was in Montana in the late 1980s when he and Joanne were wandering around the foothills in their decrepit old Toyota Landcruiser (or was it Mort's "beloved" VW bus?) looking for geological evidence pointing to probable archaeological sites. Passionate, open, wry, even spry in those days, Mort knew all there was to know, I believed, about rocks and could read them like a book.

One of the last was on a day's excursion to Mary's Lake and Glacier in Colorado last fall. Joanne was driving the same old Toyota (or was it Mort's "beloved" Mercedes?). It was after a savage stroke had robbed Mort of his ability to read; hard for any of us to deal with, devastating for Mort. But he could see clearly in the distance and for the whole trip, to our great joy—and I'm sure to his—he read the rocks like a book, teaching every single second of the time.

In the years between these images of Mort, we had discovered our shared penchant (okay, "obsession") for packing our respective garages with books (all of the "beloved" cars lived outside), and when I visited in Boulder, we would go "out to play" which meant visiting every used book store in town. That is when I learned that Mort knew everything about everything, and never stopped learning and teaching, no matter the subject. He didn't head for the Geology section in these stores; instead his eclectic tastes took him on searches for books on topics such as prehistoric runes, stone circles, science fiction, country music, Rocky Mountain history, water rights, stamps, postmarks, maps. You name it, he was looking for it. Every book dealer in the county knew him (and surely welcomed him) on sight.

It was then that I fell in love with Mort, joining a cast of a thousand women who adored him (he, of course, had eyes only for Joanne). He taught me so much about living and, in the end, about dying, with grace and dignity and, if anyone could do it, with gentle good humor.

–Jo Ann Harris
Former chairman, CSFA Advisory Board

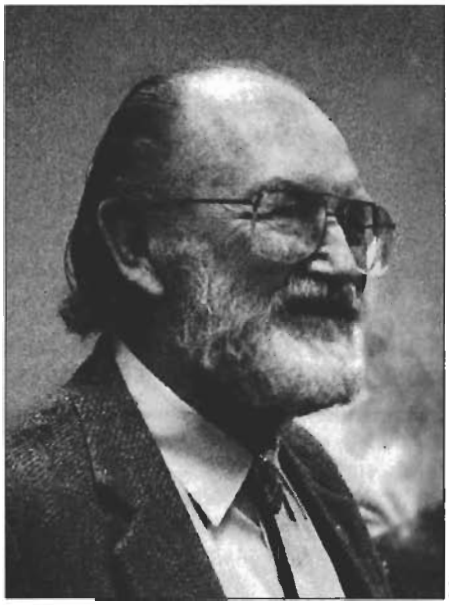
MORT AND JOANNE TURNER have been dear friends for many years. I've known Mort since an extensive trip through South America examining early sites with Rob, Mort and Everett Long 1988 or 1989. Mort was absolutely passionate about the process of scientific discovery. Whether at Mammoth Meadow or in South America, his quiet enthusiasm about a way of looking at an archaeological problem from his considerable knowledge of geology was contagious.

The first day we met was in Rio at the beginning of a South American trip. Mort and I went shopping for Brazilian gemstones. We were walking along Ipanema Boulevard in the middle of a Saturday afternoon when we were accosted by two fellows with knives. They grabbed for Mort's camera. Instead of surrendering his Nikon to the muggers, he fought them off while they stabbed at his arm. After some bystanders helped him fend them off, he stood there triumphant—with his camera and a bleeding arm. Despite his congenial gentlemanly manner, his determination was surprising in a tough situation. . . .

His knowledge was incredibly broad about history, literature, geography, politics—and scores of other subjects. He always would

for mealtime conversations—often settled arguments and stimulated discussions about the news."

If Mort harbored ambitions about a career in archaeology, a few head-on collisions with reality jarred them loose. When he was 16, Joanne tells us, his mother took him to the famous Lindenmeier Folsom site near Fort Collins, Colo. She asked the head of the excavation his recommendation about "someone" (meaning Mort) going into archaeology. "Only if you are independently wealthy," he replied. Says Joanne, "That ended that."



DON ALAN HALL

When Mort entered the University of California at Berkeley, the Archaeology Department was preoccupied with Middle East archaeology—which required learning Hebrew. That finally decided it: Mort went into geology.

World War II understandably diverted his attention. Mort earned his bachelor's in geological engineering while serving as an ordnance technician. After the war he worked with the California Bureau of Mines and Geology. He left in 1954, with his master's in his pocket, to set up the first State Geological Survey in Puerto Rico.

In 1959 the National Science Foundation recruited Mort to help manage the U.S. Antarctic Research Program, a project still in its infancy. "He was the one who grew the Antarctic earth sciences program following the International Geophysical Year 1957–59," says Guy Guthridge, Manager of Antarctic Information in the NSF Office of Polar Programs. It was a time, according to Mark F. Meier, former director of the Institute of Arctic and Alpine Research (INSTAAR) of the University of Colorado, "when Antarctic research was just emerging from a period of geographic exploration to its present status of multi-disciplinary and multi-national scientific achievement of importance to understanding global climate change, earth structure, and the evolution of life."

Armed with a doctorate from the University of Kansas, Mort as project manager developed a wide and diverse program in polar research. Wesley E. LeMasurier, retired professor of geology at the University of Colorado at Denver, describes Mort's accomplishments: "His tenure saw the initiation of major ice drilling, sediment drilling, and meteorite collecting programs which continue to this day in much expanded and diversified

back up his statements with a printed reference if challenged. In fact, we used to kid him about being "a voice activated computer." If asked a question, Mort invariably had an answer.

He was a kind and gentle man. I am among those who will never forget him.

–Anne Stanaway
Former chairman, CSFA Advisory Board

WE KIDS called Mort by his first name from the time we could talk. As you can imagine, he never fit the stereotype of the dads on TV shows. But no matter what we were doing and no matter how unconventional our life together seemed, we always had a sense of him as a kind and accepting father. He wanted to encourage any interests we had, anything that fostered enthusiasm and learning. He often typed letters at our dining room table and was always willing to interrupt his work to type out a story I wanted to dictate. He took each of us out in the field with him so we could have some one on one time and learn a little about our environment. He was the one who would come in the middle of the night if I felt sick or saw a bug in my room and needed him to save me from it. He never tried to tell us what we should think, only that it was important we learn how to think and how to question. He never dictated our choices of areas to study. He always encouraged us to find the things that made us excited and then helped us find ways to pursue those. . . .

One thing we never doubted was the importance to Mort of being a person of principle. He drove me through the roughest slums in Puerto Rico to deliver clothes our family had outgrown. He wanted to make sure we understood, even though we lived comfortably in the middle class, that most of the world does not and that we have a responsibility to never lose sight of that. He modeled compassion with principle. He would not hand out cash to street people but would buy them sandwiches and then sit down to eat with them. I truly never heard him speak ill of anyone we knew. He lived by the idea of only talking about someone if he had something good to say. . . .

Mort considered himself an atheist but we always had a shelf of religious books at home. There was a Bible, the Torah, even a Book of Mormon. He always told us it was fine to decide not to believe in something but we had to understand the idea before we could decide not to believe in it. He didn't even balk when I decided to start going to church with my friends. Later he said he figured I'd get over that phase! . . .

He also taught us about not holding out on love when it comes along. When he fell in love with Joanne, I think the only thing that might have made him like being married to her even more is if she had been able to go to the office with him every single day! After he retired from the National Science Foundation, they worked side by side on every project.

Mort loved working in the field. We kids figured he only took the job at the National Science Foundation so he could put us all through college. He told me I could pick any college I wanted and he would pay for it. I knew how important this was to him—not that I go to college, but that money would not be an issue when it came time to decide. I understood the sacrifices he was making, and I always had the feeling it was agonizing for him when he had to make the decisions about allocating that NSF research money, having to decide whose project to fund, whose to renew and whose to discontinue.

Mort could always surprise me, no matter how well I thought I knew him. Once he came for a visit when my daughter was two

forms. With his support, the Antarctic ice sheet was first drilled to its base in 1968, and sediments in the Dry Valleys of Antarctica were penetrated in the early 1970s. Numerous subsequent drilling programs of this kind form the data base upon which much of our knowledge of climate change is based."

"He worked hard—given the budget and the operational resources available—to field as many investigators as possible from universities around the country," Guthridge explains. "For a sense of the scale of Mort's program at NSF, the 1984 review issue of the *Antarctic Journal* contains 43 papers by scientists he selected and funded in terrestrial geology and geophysics, marine geology and geophysics, meteorite studies, and mapping.... By contrast, when Mort started in 1959 I count four antarctic field projects in geology and geophysics."

In 1965 Mort's wife of 20 years, Laura Perez Mendez, was killed in an auto accident. He married Joanne Church the same year and became stepfather to Chris Dort, her son from a previous marriage; she became stepmother to his daughters, Satia and Ylla, and to his son, Robert.

For a rough idea of the vastness of Mort's achievements during his 22 years as program manager of Polar Earth Sciences, consider his publications—more than 70 scientific papers—and discoveries that bear his name:

- *Morturneria seymouriensis,* the fossil of a new type of Cretaceous plesiosaur found during research on Seymour Island, Antarctica;
- Turner Hills (82° 58′ S, 156° 18′ E), a group of hills in the northwest part of the Miller Range;
- *Chlamys tuftsensis Turner,* a fossil bivalve found in the area of the Vestfold Hills, East Antarctica;
- *Caribosiren turneri,* the fossil of an Oligocene sirenian (manatee-like) skull. (Joanne recounts that Mort, on finding the fossil, sent word to UC–Berkeley that he had discovered evidence of an animal he couldn't identify. Would they pay to ship the fossil back to the States? When they refused, Mort carried it home with his baggage.)

In 1984 Mort retired from NSF, but not from research. Long skeptical of the Clovis-First theory that dominated First Ameri-

years old. She was showing him the toys in her room and I was cooking dinner. After a while, I wondered what on earth could be entertaining them for so long in her room. I walked to the door and found Mort sitting on the bed, with Lisa arranging her collection of about thirty little brightly colored plastic barrettes in his hair and beard. I can't believe I didn't get a picture of that scene!

I will miss him so much.

–Tina (Ylla) Romdall, Mort's daughter

THIS VOLUME is dedicated to Mortimer D. Turner—geologist, administrator, philosopher, and friend—for his long and effective service to the geology, and the geologists, of Antarctica....

The U.S. Antarctic Research Program was founded within the National Science Foundation in 1959, and Mort became an assistant to the program director that year; he was responsible for a large fraction of the science program, including geology. He took leave of NSF from 1962 to 1965 for graduate study at the University of Kansas, receiving his Ph.D. later in geology and metallurgical engineering. On his return to NSF in 1965, Mort became program director, Antarctic Earth Sciences, responsible for geology, geophysics, glaciology, and oceanography. In 1970 he was made program manager, Polar Earth Sciences—with additional responsibility for the Arctic....

Mort Turner spent 22 years at NSF in the administration of Antarctic research. While he was able to carry out some personal research at the beginning, he really surrendered himself to administration so that other scientists would have the chance to work in Antarctica. It is likely that no other administrator anywhere has had as much direct impact on advancing our understanding of Antarctic geology; the Turner Hills, Antarctica, were named by the U.S. Board on Geographic Names.

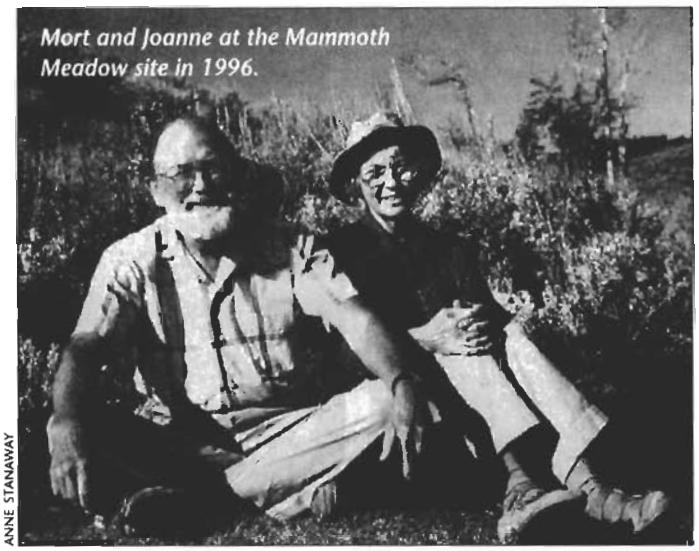
It was not unusual to find large stacks of documents on Mort's desk at NSF. This logjam was the result of 1) Mort's limited interest in paperwork, 2) his periodic visits to Antarctic field camps, and 3) in particular, his tendency to delay some grant decisions to the latest possible date. This latter trait drove his superiors to despair and his proposing scientists to anxiety, or sometimes worse. But geologists in his program gradually realized that his real motive for delay was his deep desire to support as many of the worthy as possible, and he waited in the hope that his pleas would produce more funds for his intended grants. He listened with interest to all who contacted him, and he gave all the moral and financial support that he could.

Mort Turner came to NSF to serve his community, and not to rule. While he was over us, at the same time he was one of us. It is because of his earnest, compassionate service that Mort is regarded so highly by us and by many other Antarctic earth scientists.

–From the dedication of Geology and Paleontology of the Ellsworth Mountains, Antarctica, *edited by G. F. Webers, C. Craddock, and J. F. Splettstoesser (1992)*

IN THE EARLY 1980s, shortly after I started the Center, I had a fortuitous meeting with Mort and Joanne Turner at the University of Maine at the American Quaternary Association meetings. I had met Joanne more than 20 years earlier on an archaeological dig in the Birch Creek Valley of Idaho. Joanne had accompanied Mort, then the Director of NSF's Polar Program. At that time, I was trying to establish the fledgling Center for the Study of Early Man. During our initial conversations, I quickly realized that the Turners had an intense interest in the field of First American studies and were interested in becoming involved in the Center's mission. With funding provided by the William Bingham Trust, I had a mandate to build a Center designed to bring scholars, students, and other members of society together in an extremely contentious field with the over-arching goal of understanding how the initial peopling of the Americas occurred. The practical problem that I faced as an associate professor at a small state university was how to move the Center from a university program to one with vision, influence, and respect in the scientific community.

It is Joanne who deserves the credit for bringing Mort to the Center. In those early days, Joanne was the Chairperson of the Women League of Voters Lobby Corps. She was savvy and knew how to bring people together and build a constituency. She brought a rich repertoire of outreach skills to the task of building


ANNE STANAWAY

Mort and Joanne at the Mammoth Meadow site in 1996.

can studies, he visited such controversial locales as Texas Street site in San Diego, Calico site in the Mojave Desert, Meadowcroft Rockshelter in Pennsylvania, and Cactus Hill site in Virginia. In 1987 Mort and Joanne moved to Boulder, Colo., where both joined the staff of INSTAAR. Mort also taught courses in geology at University of Colorado in Denver.

Awards? Mort surely earned more than he received, which include the Career Service Award from the American Polar Society and the H. Marie Wormington Award (given individually to Mort and Joanne) from **CSFA** for their contribution to First Americans studies.

Remember those roadmaps? They now reside in the Smithsonian Museum of History and Technology, more than 7000 of them, curated and identified by a brass plate labeled *Mort D. and Joanne C. Turner and Chris Dort Roadmap Collection.*

Mort died May 1 this year. Following his wishes, his body was donated to the University Medical Center in Denver for research. Guy Guthridge certainly speaks for everyone who knew Mort when he says, "I will miss Mort and the ever-present twinkle in his eyes." Speaking for myself, I shall always regret that I wasn't among those privileged to know him.

–JMC

the Center's membership and organizing conferences that would be of interest to laymen and specialists alike. Mort and Joanne were the initial charter members of the Center's Advisory Board. Joanne was a significant contributor to the ideas that shaped the development of the *Mammoth Trumpet*. It was Mort, however, who chaired our Scientific Council and helped guide and expand the Center's scientific directions and influence.

Mort was a big-picture visionary with an encyclopedic knowledge of many scientific fields and knew what it takes to move scientific frontiers forward. Mort urged me to establish what became the CSFA's Peopling of the Americas program of publication. Mort knew how important it was to establish scientific monographs and journals to document discoveries and advances made in the field. He also appreciated the importance of having a firsthand knowledge of scientific evidence. Following his retirement from the National Science Foundation in 1985, he joined the CSFA's Advisory Board. We traveled together to China and then to South America, along with two other Advisory Board members, to develop a firsthand knowledge of the people doing the work and places where significant research was occurring. Mort was among the key planners who helped develop the conference concept and international slate of speakers from Russia, Canada, Mexico, and South America for our First World Summit Conference on the Peopling of the Americas in 1989.

Mort and Joanne did more for the Center than serve as knowledgeable advisors. They also were scientific contributors to this field. Along with the late Ed Zeller and Giesla Dreshoff, they published a ground-breaking paper "Impact of Ice-related Plant Nutrients on Glacial Margin Environments" in our book *Ice Age Peoples of North America*. In this paper, they established the geochemical foundation for why ice marginal environments were evolutionary centers in the Americas and Eurasia. It is my opinion that this is the most significant paper ever published by the Center. They also were full partners and co-principal investigators on our Mammoth Meadow project located near Dillon, Montana.

As the director of the first and only international center dedicated to the peopling of the Americas, I can say there are enormous challenges that face the future of our field. As I think of the issues the CSFA faced during recent years including changes in how some Departments of Anthropology view the scientific approach, shifts taking place in Federal public policy regarding the use of America's cultural and biological resources, and the ongoing attack against science by some sectors of society, I always think of Mort. His strong basic belief system has served me and the Center well: always be kind to others; use logic and reason to guide your actions; and stay focused on the most important scientific issues.

The Center is now located in a strong and healthy research environment in the Department of Anthropology at Texas A&M University. We at the CSFA continue to believe that science provides the most satisfactory approach for learning about the past. I believe that Mort's strong role model helped shape the Center and its directions. Thank you, Mort!

–Rob Bonnichsen
CSFA Director

THE FIRST YEAR I volunteered at the Mammoth Meadow dig of the Center for the Study of the First Americans in southwestern Montana, the assembled group made a few study stops between the dig site and the nearest town—45 miles away. At one of these stops Mort took me aside and asked if I would come with him and Joanne a short distance to inspect an embankment beside a gravel pit. When we arrived at the embankment, he asked, "What do you think this material is?"

I looked at it a moment and said, "It's glacial till. But this area wasn't shown as having ever been glaciated on the maps I've seen."

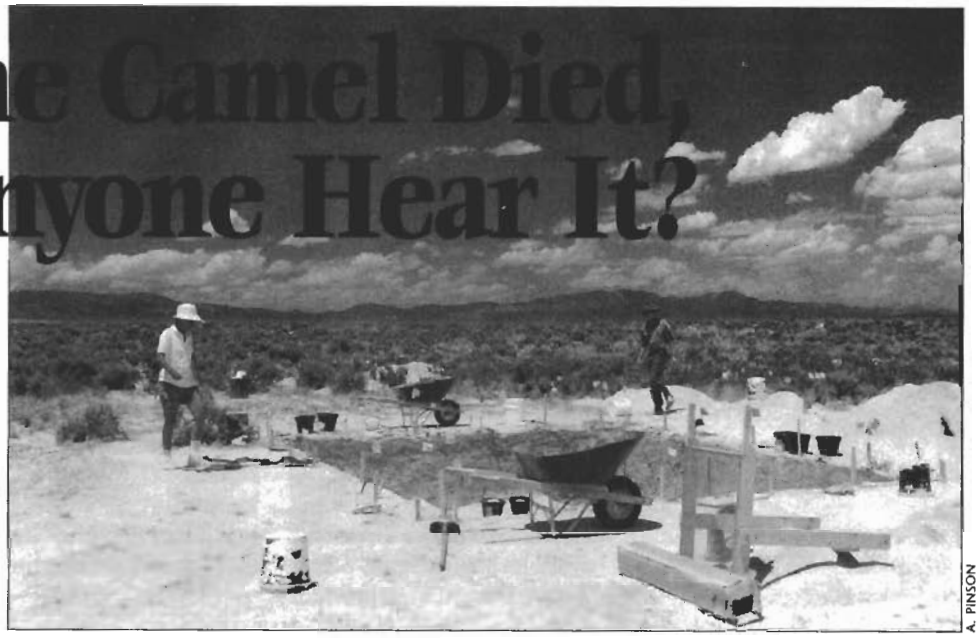
Mort brightened and replied, "That's what we think it is, too. But we just wanted to get the opinion of someone from Wisconsin where there's been lots of glaciation."

From that day onward Mort and Joanne made me a part of their circle of friends, invited me to join their investigations, shared their ideas and plans with me and asked a host of questions as we worked together. But first, Mort wanted to be sure I knew a few of the basics. It was very fortunate for me that I did.

–Marv Beatty
Soil Scientist, University of Wisconsin
Former chairman, CSFA Advisory Board

When the Camel Died, Did Anyone Hear It?

Archaeological Research at the Sunshine Locality, Nevada



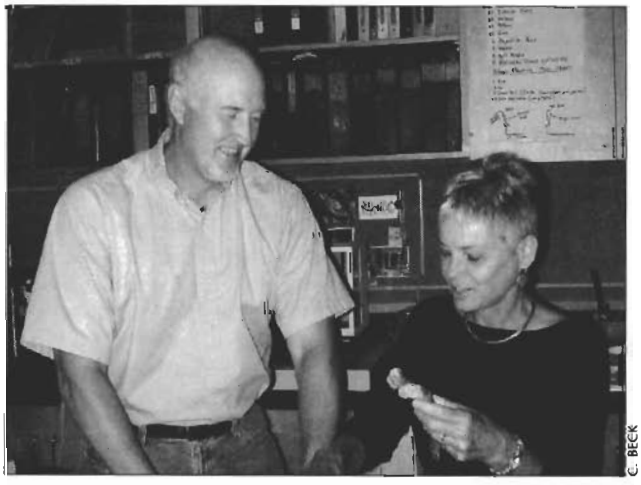
A. PINSON

Charlotte Beck (*left*) at the Sunshine locality excavations, 1993.

IN THE SUMMER OF 1993, fresh from my first year in graduate school, I drove out into the remote Nevada desert to get my first taste of Great Basin Paleoindian archaeology. With Easterner's eyes I studied the alien landscape as I barreled down Route 50, across mountain ranges studded with junipers and flat basin floors under cloudless blue skies. Turning north onto a dirt road at the head of Jake's Valley, I nosed my Ford Escort wagon along rutted roads and over dry creek beds into the field camp at Indian Springs.

Once there, I was warmly greeted by Hamilton College researchers Charlotte Beck and Tom Jones. Dr. Beck is a petite energetic woman keenly interested in changes in Paleoindian projectile points over time, with particular emphasis on the methods and theories used to convert artifact styles into chronology. Dr. Jones, her husband, is a soft-spoken man interested in patterns of Paleoindian lithic raw material use, mobility, and the paleoenvironments through which people once moved. Both researchers have been at the forefront of developing theoretical approaches to chronology based on evolutionary biology, a collaboration that began during their graduate studies at the University of Washington. Over the campfire that night, we discussed their ongoing research into eastern Nevada Paleoindian prehistory.

Early the next morning, we drove across the dusty flats of Long Valley to the Sunshine locality. Standing amid the sagebrush, saltbush and winterfat, it was hard to appreciate the significance of the lithic debitage scattered around my feet. But looking at a map of the debitage, along with the location of more than 850 Paleoindian projectile points recovered from the site, it was obvious even to me that this locality had a lot to tell us about the earliest occupation of the central Great Basin and the North American continent.



C. BECK

Tom Jones and Charlotte Beck in their lab at Hamilton College.

Camel bones and artifacts recovered together: Evidence of camel hunting?

The land and vegetation around the Sunshine locality is rimed with the fine, white silt of ancient lakebeds. For more than ten millennia, wind and water have reworked these lakebed sediments, lowering the surrounding hills while filling in ancient river channels and washes. The pancake-flat valley floor is a modern illusion; meters below lies the sedimentary record of ancient marshes and streams, once home to ducks, fish, horses, camels and people, a lush landscape impoverished by the warm, dry climates of the Holocene. With such an abundant surface record, did Sunshine harbor deeply buried, in situ archaeological deposits as well?

This was the question that animated initial subsurface testing at the locality in 1987–1990 by a team from the Desert Research Institute (DRI), the Nevada State Museum, and the Bureau of Land Management (BLM) led by Cynthia Irwin-Williams. What they found in their backhoe trenches electrified the Great Basin archaeological community. In a series of papers at the 1990 Great Basin Anthropological Conference, the team

announced that camel teeth and bones, along with a single piece of stone tool debitage, had been recovered from a deposit several meters below the surface. The association wasn't secure—the researchers didn't know if the bones, teeth, and debitage were the result of a single activity or had accumulated in the deposit over time. But the possibility of an association was tantalizing; if true, this would be the first direct evidence of humans hunting camels during the Pleistocene in the Great Basin. To prove it would require detailed excavation of the site. Plans were cut short, however, by the deaths in 1990 of both Irwin-Williams and project geologist Jonathan Davis.

C. BECK

A, camel bones from the gravels; found beneath the bones were B, andesite biface, C, GBSS stem, and D, scraper. Materials found elsewhere in the gravels were E, blade, F, fluted-point base, and G, crescent fragment.

The following year, BLM archaeologist Pat Barker asked Beck and Jones to take over research at Sunshine. The DRI-led research had ultimately been inconclusive. Had the camel bones, teeth, and debitage really come from the same strata? If so, were they really associated, or had they accumulated together by other means? What did any of this tell us about life at the end of the Pleistocene in this corner of the Great Basin? Beck and Jones, who had spent several years conducting archaeological surveys in nearby Butte Valley, were determined to find out.

The geology tells a different story

As with all archaeological enterprises, it is the details of the stratigraphy that matter most, for it is the details that establish context and association, and that constrain what we can say with certainty about a site. So it was with the geology that the two archaeologists began their research. Following a short field season in 1992, during which Jones and DRI geologist Fred Nials cored at the site, Beck and Jones began four summers of excavation and geoarchaeological research at the site in collaboration with Washington State University geoarchaeologist Gary Huckelberry.


C. BECK

Tom Jones takes sediment samples during the 1993 excavations. The alluvial sand and gravel deposit that produced the camel bones and associated artifacts is visible in the lower part of the photo.

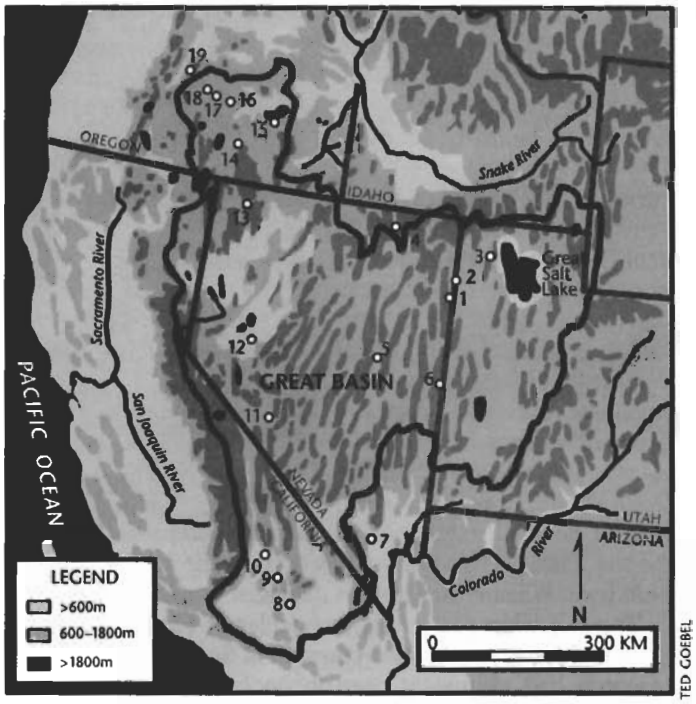
The first year's excavations, which I participated in as a field school student, produced no camel bones but showed that Beck and Jones were on the right track. As expected, an alluvial deposit was visible in the lower part of the 5-by-6-m excavation block. Debitage occurred throughout this deposit, along with the bones of small mammals, birds, and fishes. Clearly this was the right deposit, but it would be two more summers before they found camel bones, and these of a camel different from that located by the DRI team.

The camel bones—a scapula, phalanx, unciform, and other bones belonging to *Camelops hesternus* (Yesterday's camel)—were associated with debitage and formal tools. A fluted point and crescent were recovered from the deposit, along with more than 1,000 pieces of debitage. Directly adjacent to and beneath the camel bones was a stem section of a Great Basin Stemmed Series point (GBSS, a member of the Western Stemmed Tradition family), an andesite biface, and a scraper. Beck and Jones were elated—they had their association. Then doubt began to creep in. Why exactly were the bones and artifacts occurring together?

It was the fact that the camel bones and artifacts had been recovered from alluvial deposits that worried Jones and Beck the most. The layers of sand and gravel making up the deposit had been laid down as part of a gravelly bar building out into a channel of a vigorously flowing braided stream. Such a stream would have been a great place to kill or butcher a large animal such as a camel. But the stream would also have been strong enough to erode its banks, mixing bones from one terrace location with artifacts from another. The problem was, Which scenario was correct?

One way they approached this question was to examine the distribution of artifacts and bones in the alluvial deposit. When artifacts and bones are transported and deposited by a stream, they sort by size along with the sand and gravel in the stream bedload. However, humans engaged in butchering a camel on a point bar wouldn't pay much attention to the size of the gravel beneath their feet; they would just drop their stone tool resharpening debris wherever they happened to be standing. Consequently, we wouldn't expect to find a relationship between the grain size of the sediments and artifact size in the resulting archaeological deposits. So Beck and Jones and their students compared the size of debitage with the grain size of the deposit, carefully considering artifacts found in gravel lenses separately from those recovered from sand lenses. To their dismay, two clear trends were obvious.

First, artifact size was strongly correlated with sediment grain size: smaller debitage was concentrated in the sandier



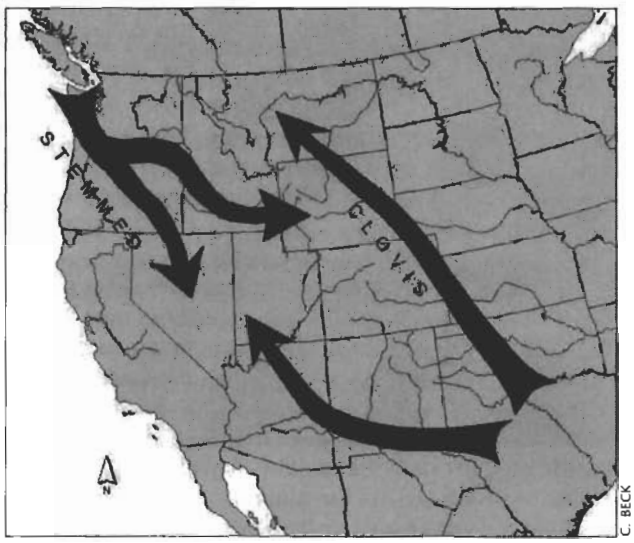
Significant Great Basin sites: 5 Sunshine; 1 Bonneville Estates Rockshelter; 2 Danger Cave; 3 Hogup Cave; 4 Deer Creek Cave; 6 Smith Creek Cave; 7 Tule Springs; 8 Calico; 9 Henwood, Roger's Ridge, and Awl; 10 China Lake; 11 Tonopah; 12 Spirit Cave; 13 Last Supper Cave; 14 Dietz and Tucker; 15 Nials; 16 Buffalo Flat; 17 Connley Caves; 18 Fort Rock Cave; and 19 Newberry Crater.

lenses while large debitage had been recovered from more gravelly lenses. No artifacts could be unambiguously tied to pure sand lenses. Second, the number of artifacts decreased in the excavation units towards the center of the stream channel and in a downstream direction, just as we'd expect if they had been washed into the site from somewhere nearby.

Another way the archaeologists examined transport was to look at damage on the edges of artifacts. A sample of 31 artifacts analyzed by one of their students showed that 100 percent of the artifacts exhibited edge abrasion typical of stream transport. However, when subjected to microscopic examination, about a third of the edge-damaged artifacts had damage that resulted from processes other than stream transport.

Although the majority of artifacts were likely transported to the area excavated by Beck and Jones, there were three reasons that the researchers couldn't rule out the possibility that the deposit contained a mix of transported and in situ materials. Most of the artifacts appeared to come from near the top of the gravel beds rather than being distributed throughout, which suggested an occupied surface. Artifact damage was not uniform, indicating that while some artifacts had been transported a long distance, others had not. There was no water wear at all on the artifacts directly associated with the camel bones. Finally, in several instances, the same gravel lense produced tight clusters of debitage made of the same rare raw material. Such clustering is unlikely by chance. It indicates that the flakes were likely deposited together at that location, as we'd expect if the flakes were the waste from a single flintknapping episode.

Presented with the possibility that some of the artifacts were in situ, Jones and Beck were hopeful that they would find cut marks on the camel bones resulting from butchering the carcass. Cut marks would at least unambiguously tie the camel's death to human causes and strengthen the case for association between the bones and immediately adjacent artifacts. The bones, however, were devoid of cut marks.



The Beck and Jones model of the peopling of the Great Basin.

The Sunshine locality raises more questions than it answers

Although disappointed that they weren't able to prove the association between the camel bones and human occupation in the excavated portions of the Sunshine site, Beck and Jones still think the site is significant. For one thing, says Beck, the radiocarbon date of 11,330 ± 60 RCYBP (Beta 105662), about 11,487–11,207 CALYBP, on the camel phalanx is the youngest date for camels in the Great Basin. The same stratum produced the bones of horse (*Equus* sp.), along with 1,236 bones of other mammals, birds, and fishes, making the deposit a significant source of information on late-Pleistocene biota in eastern Nevada. California State University–Long Beach archaeologist Mike Cannon, a fellow University of Washington graduate and collaborator on the Sunshine research, has been studying the Sunshine faunal remains and is considering additional fieldwork at the locality.

Another product of Sunshine research that Beck thinks is significant is the collection of fluted points recovered from the surface and from dated subsurface deposits. Although smaller and thinner than the well-known Clovis point, like Clovis points they are fluted on both sides and made from high-quality toolstone, usually chert. Beck and Jones believe Sunshine points are later in time than Clovis, perhaps contemporary with Folsom/Midland points on the Plains. A limiting date of 10,320 ± 50 RCYBP (Beta 83090), about 10,398–9993 CALYBP, was obtained at Sunshine on charcoal located 13 cm above a buried Sunshine point.

Although many researchers call all fluted points in the Great Basin "Clovis," Beck and Jones are reluctant to do so because of the paucity of dates on these points. Instead, they follow Donald Grayson in using the term "Great Basin Fluted" (GBF) to refer to all fluted points in the Great Basin, including the Sunshine types. Beck and Jones have recently argued that GBF points may not represent the earliest human arrival in the Far West. Instead, this arrival may be represented by the ubiquitous Great Basin Stemmed Series (GBSS) points, which, at sites like Coopers Ferry, Idaho, have been shown to date back to 11,400–11,300 RCYBP. What is the relationship between these two point traditions? Does their presence in the Great Basin by 11,000 RCYBP point to two different founding populations, the fluted points coming with settlers from the South and Southeast (Texas, New Mexico, Arizona, Mexico), the GBSS originating with immigrants from the Pacific Northwest? In an effort to answer these questions, Beck and Jones are continuing a Great Basin fluted-point survey begun by their student, Amanda Taylor.

For now, research at the Sunshine locality raises more questions than it answers. But the answers are out there somewhere, perhaps on the buried remnants of a Pleistocene stream terrace hidden under meters of windblown silt. The answers may also lie in existing collections, where detailed scientific analysis may allow us to assemble this part of the puzzle that is the history of the Peopling of the New World.

–Ariane Pinson

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Suggested Readings

Jones, G. T., C. Beck, F. L. Nials, J. J. Neudorfer, B. J. Brownholtz, and H. B. Gilbert 1996 Recent Archaeological and Geological Investigations at the Sunshine Locality, Long Valley, Nevada. *Journal of California and Great Basin Anthropology* 18(1):48–63.

Huckelberry, G., C. Beck, G. T. Jones, A. Holmes, M. Cannon, S. Livingston, and J. M. Broughton 2001 Terminal Pleistocene/Early Holocene Environmental Change at the Sunshine Locality, North-Central Nevada, USA. *Quaternary Research* 55:303–312.

Yana River, Siberia

continued from page 3

far, the best evidence of tailored clothing at Yana River is an awl made from a wolf metatarsal. This tool, which was almost certainly used for punching holes in hides, is burnished on one end and scored with a number of deliberate cutmarks. Pitulko and his colleagues suggest that the cuts might have held a hide wrap in place, which in turn burnished the bone.

Putting Yana River into context

Yana RHS doesn't exist in a complete cultural vacuum; while other finds of its general antiquity are rare in the Arctic, they do exist. It's well established that southern Siberia was settled by humans before 40,000 RCYBP, that some groups were visiting the European Arctic by 37,000 RCYBP, and that people were in nearby Yakutia at least as early as 24,000 RCYBP. An interesting locality of this sort is Mamontovaya Kurya, a site located at 66° N in the European Arctic that dates to at least 32,000 RCYBP, and possibly as early as 37,000 RCYBP. Then there's Duvanny Yar, located near the mouth of the Kolyma River in Siberia proper, which has produced copious broken faunal dating to about 34,000 RCYBP—though many archaeologists don't accept the find as evidence of human occupation. For now, Yana River retains the title of the earliest confirmed human habitation site in Arctic Siberia.

There remains that troublesome 15,000-year gap between Yana RHS and Berelekh, the next youngest site in the area. Where are the sites that would fill in that time gap? More to the point, where are the other sites contemporaneous with Yana RHS? There may not be many, if they exist at all. Archaeologist Ted Goebel of the University of Nevada, Reno, who specializes in both Siberian archaeology and the peopling of the Americas, believes that Yana River might signify a brief "pulse" of human occupation immediately preceding the Last Glacial Maximum (LGM), after which people abandoned the coldest parts of northern Eurasia for thousands of years, a hypothesis that John Hoffecker also finds plausible. And it appears that no one was especially eager to occupy the area once it was available again; although sites dating to about 17,000–18,000 years ago are known for southern Siberia, there's no evidence of significant reoccupation in northeastern Siberia until the Dyuktai culture took possession 14,000–15,000 RCYBP.

Kuzmin believes that other Yana-age sites, and possibly sites needed to fill the temporal gap between Berelekh and Yana RHS, may still be found. "These possible new sites may be found, first of all, near the main rivers like Lena, Indigirka, Yana, Kolyma, and Anadyr," he suggests. He cites two problems that have delayed their potential discovery: the fact that the sites are probably located on lowlands near the coast of the Arctic Ocean, where they're buried by up to 10 m of loess; and organizational issues that have thwarted in-depth research in Siberia. "Unfortunately, since the fall of the Iron Curtain, no foreign scholars have even tried to make a full-scale expedition along with Russians to northeastern Siberia to find new Paleolithic sites," he says ruefully.

Trek to a New World?

Yana RHS is unusually far north for the time period in which it occurs, though it's not unique in that respect; witness Mamontovaya Kurya, which is a bit older if not quite so far north. Unlike Mamontovaya Kurya, Yana RHS lies within the nearly uninhabitable Siberian Arctic on the fringes of Beringia—the region that

sometimes connected Asia and North America during the Quaternary ice ages. This vast corridor, which spans the area between the Lena River in Siberia and the Mackenzie River in the Yukon, has long been considered the most likely route of human migration from the Old World to the New. Since Beringia is partly underwater these days, it's only on the icy rims at the northern edges of the continents that archaeologists can effectively look for clues to the origins of the First Americans.

An Oversight . . .

Our article "Megafauna of Mexico" in the June 2004 **Mammoth Trumpet**, which described the research on early humans at Valsequillo and the investigation of mammoth remains and possible human association at Tocuila currently pursued by Senior Scientist Joaquín Arroyo-Cabrales and his colleagues, failed to mention the contribution of archaeozoologist **Oscar J. Polaco** of the Instituto Nacional de Antropología e Historia (INAH) in Mexico City. In addition to serving as a principal member of the Tocuila research team, Professor Polaco also planned the exhibit of materials at the in situ museum.

Might the Yana River people have advanced east to colonize the new continent waiting on the other side of Beringia? Possibly; it depends on how early they were there, and at what time of year they undertook the journey. As Yana RHS and other sites have proven, game was plentiful in Beringia. If the Yana River hunters followed migrating game herds east across the Beringian steppes, they would have had no clue that they were passing from one continent to the next—only that they were entering a place where game was plentiful and competition scarce. As highly mobile hunter-gatherers, they could have made the trip in a few months. However, weather would have allowed only a narrow window of time in the year for travel, and they could only have advanced into North America if the ice-free corridor between the Cordilleran and Laurentide ice sheets was still open. When the ice sheets coalesced no later than 19,000–20,000 years ago, the way slammed shut and wouldn't open again for many thousands of years.

Despite the difficulties, they could have made the trek, and it is this possibility that has excited many researchers. "For me, the significant thing is that the site dates *before* the Last Glacial Maximum—before the time the ice-free corridor in northwestern North America closed," says Goebel. But colleague Hoffecker, among others, doesn't share Goebel's optimism about a potential Yana River colonization of the New World. He emphasizes a crucial point that's easily overlooked: that sites like Yana RHS and Mamontovaya Kurya were probably warm-weather seasonal encampments only, occupied by groups that lived hundreds of mile further south during the winter. If groups weren't living at Yana RHS on a year-round basis, he reasons, then they would have found it difficult to permanently colonize Beringia (all of which is above 60° N) and thus move into the New World. He also cites recent studies suggesting that the ice-free corridor into North America may have been sealed as early as 30,000 years ago.

So where does this leave us? As always, the issue of "who's on first" remains cloudy. It's clear that humans were in northeastern Siberia very early on, and certainly they could have continued east into the Americas. However, it now seems that they would have had to do so before about 30,000 years ago, and even then they could have accomplished it only if they started early enough in the year and were able to get far enough south to be safe when winter came.

Much has been made of the possibility that the Yana River hunters were the ancestors of the Clovis culture, particularly by the general media. Their arguments are bolstered by the fact that some of the organic tools at Yana River, particularly the ivory and rhinoceros horn dart foreshafts, are very similar to artifacts used by the Clovis culture; furthermore, both cultures had distinctive (if dissimilar) bifacial stone tool industries. Pitulko and his coauthors cautiously implied a potential connection between Yana River and Clovis in their recent article in *Science*, and it didn't take more than a few hours after the article's publication for news outlets from the BBC to the Associated Press to latch onto this intriguing prospect.

Though most researchers downplay this possibility, it has nonetheless generated a spirited debate about Yana River's relevance to the peopling of the Americas. This debate and related arguments will be the subject of the final article, "The Controversy," in this series.

–Floyd B. Largent, Jr.

'Rip Rapp' Award

continued from page 1

tion to the department and the caliber of faculty that work here," Carlson said. Although Waters is still relatively young, Carlson said there was still much to be done within his extensive research.

Director of the **CSFA** Robson Bonnichsen said that Waters receiving the award reflects recognition by his colleagues of the high-quality effort that goes into his work.

"It's a terrific achievement that he's been recognized by his peers in geology as the excellent scholar that he is," Bonnichsen said.

Waters is constantly on the move between archaeological sites. He has recently returned from a site in Mexico only to be leaving soon for Mud Lake in Wisconsin.

Waters is also the recipient of the 2003 Kirk Bryan Award from the GSA for his research with C. Vance Haynes that was published in a geological journal entitled "Late Quaternary arroyo formation and climate change in the American Southwest."

–Joanna M. Jemison
THE BATTALION, *19 July 2004*
Reprinted with permission

The Curse of PLENTY

A friendly gene turned hostile may be threatening a generation of Hispanics and Native Americans

THERE'S BAD NEWS to report on the battle against fat in the U.S., and even worse news. The bad news is that two-thirds of American adults are overweight and half of those are certifiably obese. The worse news is that the picture is *much worse* for Hispanics and Native Americans. Obesity and the diseases that accompany it, especially diabetes, are crippling an entire generation of their population in the Southwest.

This is a state of war, and Carolyn Marshall and her colleagues in the Department of Medicine at the University of Texas Health Science Center in San Antonio (UTHSCSA) are fighting in the front line, the classroom. By training middle school and high school teachers in ways to prevent obesity and disease, and to recognize the conditions where they appear, they are arming students—and school administrators, parents, grandparents, and the entire community.

Dr. Marshall is project director of Positively Aging® (grant #R25-RR-18549[1]), which addresses obesity and mobility, and MORE (grant #HL-75777[2]), which deals with heart, lung, and blood issues. Both grants, which were recently awarded, have 5-year terms, and both are focused on minority middle school and high school students. Principal investigator of these grants is Dr. Michael Lichtenstein, who has worked with Marshall for 11 years. "The overall goal for both grants," says Marshall, "is the prevention of these conditions in children before they develop." Good nutrition and healthy exercise are the only weapons that will eventually win this war, and there are hopeful signs that it is winnable. A public-health educator also trained in anthropology, Marshall finds she has an audience eager to learn about paleonutrition and the physical activity that sustained the lives of their vigorous ancestors.

Once were giants

No sadder tale of a fall from greatness can be told than that of the Zuni. In 1924—barely three quarters of a century ago, a blink of the eye in evolutionary time—physician Henry Craig Fleming studied the Zuni on their New Mexico reservation and reported in great detail to the Museum of the American Indian Heye Foundation about this remarkable people. It wasn't their appearance that Dr. Fleming found remarkable. Men's average height was 5-foot-8, women's a couple of inches less. Younger men weren't heavily muscled; they were wiry yet surprisingly powerful, despite prominent ribs and joints. What impressed Fleming was their running. Zunis ran for the pure joy of running. "It is a common sight," he reports, "to see one or more of these Indians, while going from one pueblo to another, a distance of fifteen or more miles, run the entire distance without stopping." A favorite game was the race of the kicked stick, run over a course of 15 to 20 miles. His account of these extraordinary athletes is astounding:

> Examination of eight Zunis immediately after the finish of a stick race, at which time they were bathed in profuse perspiration, revealed comparatively no evidence of fatigue, no evidence of respiratory distress, and no heart rate above 106 beats per minute.

What's more, their superb physical condition carried into old age. Fleming was astonished to find 70-year-old men, who were engaged in activities requiring great effort and endurance, registering diastolic blood pressure of 60–75 and systolic pressure of 110–125. Hypertension simply didn't exist among the Zuni.

Today the Zuni are suffering an epidemic of obesity and diabetes and a host of associated illnesses—coronary heart disease, hypertension, and complications of diabetes that include diabetic retinopathy (damage to the blood vessels in the retina caused by high glucose levels in the blood), neuropathy (damage to the nervous system), end-stage renal disease (ESRD, kidney failure caused primarily by simultaneous diabetes and hypertension), and amputation of the feet and legs. In just 80 years the health of the population has plummeted.

The Pima and Tohono O'odham Indians of southern Arizona also look back with sadness at days of former greatness. CBS News correspondent Vicki Mabrey visited their reservation and spoke with tribal elder Robert Porter, who remembers when his people were physically strong. "Our Pima-Maricopa people were runners," he recalls, "strong runners; silent runners." Porter himself was once a marathon runner. Age 59 at the time Mabrey spoke with him, he was in a wheelchair, "alternating between the reservation dialysis center, and the reservation hospital, where doctor Wes Yamada [was] trying to save his legs."

Today the Pima hold the tragic distinction of suffering the highest incidence of obesity and diabetes *in the world.*

This epidemic of obesity isn't confined to our shores. The second-highest incidence is found in native Hawaiians. "Hawaiians were never fat, apart from the royalty," remarks Terry Shintani, director of preventive medicine for the Waianae Coast Comprehensive Health Center on the island of Oahu; "now I have 300-pound patients by the dozen."

[1] National Institutes of Health/National Institute on Aging, National Center for Research Resources, Science Education Partnership Award

[2] National Institutes of Health, National Heart, Lung, and Blood Institute, Minority K-12 Initiative for Teachers and Students

Diabetes, the silent killer

Obesity itself doesn't kill. It is unhealthy because it stresses the body's structure and organs and, more important, makes the body vulnerable to opportunistic diseases. The worst of these is dread diabetes, a disease caused when the body either doesn't produce insulin or can't utilize it. Insulin, a hormone secreted by the pancreas, "unlocks" the cells of the body and enables them to convert food into energy.

Despite the fact that diabetes has afflicted mankind since earliest recorded history—the symptoms are described in the writings of ancient Egypt, China, and India—it defies our efforts to predict its occurrence with absolute accuracy. We only know for certain that two conditions must exist in order for diabetes to occur: the individual must be genetically predisposed; and a trigger of some kind must be actuated. Once contracted, diabetes is incurable. In most cases, however, proper care can control its symptoms and reduce its effect on the body.

There are two principal kinds of diabetes, type 1 and type 2. In type 1, also called insulin-dependent diabetes mellitus (IDDM), the pancreas produces little or no insulin. Victims of type 1 diabetes probably inherit risk factors from both parents. Frequently the disease develops over many years. Scientists suspect possible triggers are cold weather (the incidence is higher in winter than summer and in cold climates), viruses, and early diet (it occurs less commonly in people who were breast-fed and didn't eat solid food as infants). About 5–10 percent of American diabetics have type 1.

ALL PHOTOS: MARYANNE TOEPPERWEIN, EDUCATIONAL DEVELOPMENT SPECIALIST FOR POSITIVELY AGING® AND MORE CURRICULAR PROJECTS

A crash course in anthropology—Marshall shows the teachers how the Asian ancestors of Amerindian people migrated to the New World, bringing with them the supposed Thrifty Gene, a principal cause of the obesity that today imperils the health of Hispanics and Native Americans.

Type 2 diabetes, non-insulin-dependent diabetes mellitus (NIDDM), is the disease that is growing at an alarming rate, especially among minority populations. It used to be called adult-onset diabetes; sadly, that name no longer applies. "Today," Marshall notes, "children as young as six years old are developing it." The body of a person suffering from NIDDM produces insulin, at least in early stages of the disease; however, because of a condition known as insulin resistance, the cells of the body are unable to utilize insulin and therefore cannot metabolize glucose—burn it and convert it into energy. In early stages of NIDDM, victims typically have elevated levels of glucose in the blood (hyperglycemia) and in the urine (glucoseria); they also have excessive amounts of insulin (hyperinsulinemia), since the pancreas continues to do its job of producing insulin.

The glucose-insulin interaction is one of the metabolic processes that break down compounds into usable components. In a healthy person it is an exquisitely fine tuned feedback system, like a thermostatically controlled furnace or a governed engine. But if the governor fails, an engine can rev up faster and faster until it destroys itself. In like fashion, physiologists theorize that if NIDDM is left untreated, the pancreas eventually becomes exhausted and stops producing insulin altogether. Blood sugar can then rise to dangerously high levels, ravaging body organs and eventually resulting in diabetic coma and death.

Nutritionists and health care providers keep telling us—even if we're tired of hearing them—that skinny is healthy, and research has borne out the truth of their preaching. Experiments with mice demonstrate that subjects fed a severely rationed diet live significantly longer than subjects that are allowed to eat their fill. In studies on people, J. M. Molina and fellow researchers found that insulin activates glucose metabolism much more slowly in obese subjects than in those of normal weight; moreover, they determined that insulin resistance, a major risk factor for NIDDM, is a *characteristic feature of obesity.* Gerald Reaven, a world-renowned authority on metabolic disorders, pursued the link between obesity and attendant diseases one step further. He found a direct relationship between the level of insulin in the blood and blood pressure; in other words, the higher the insulin level, the higher the blood pressure. There is evidence, he concludes, of a possible association between insulin resistance and hyperinsulinemia as causes, and NIDDM, hypertension, and coronary artery disease as effects. That's quite a witch's brew of illnesses, and obesity is the cauldron.

Just being obese doesn't mean diabetes is inevitable, since the genetic factor must also be present. However, obesity markedly *increases the risk* of developing diabetes, as well as many other diseases that can devastate the quality of life and cut life short.

A population at risk

Marshall and her colleagues at UTHSCSA are sounding the alarm because Hispanics and Native Americans run a far greater risk than the general population in the U.S. of developing diabetes. The American Diabetes Association reports that 6.3 percent of the U.S. population have diabetes—and a third of those aren't aware of it. This is unsettling news. But the picture for Hispanics and Native Americans is truly distressing:

- almost 50 percent of Pimas age 35 and older are diabetic;
- NIDDM is 1½ times higher in Latinos than non-Latino whites;
- 32 to 40 percent of Mexican Americans suffer from diabetic retinopathy;
- 14.5 percent of Native Americans and Alaska Natives receiving care from Indian Health Services have diabetes;

- Mexican American diabetics are 4.5 to 6.6 times more likely to develop ESRD than are non-Latino white diabetics; Native American diabetics are 6 times more likely;
- about 24 percent of Mexican Americans in the U.S. between the ages of 45 and 74 have diabetes; for Puerto Ricans in the U.S. in the same age group, the incidence is about 26 percent; for Cuban Americans, about 16 percent.

Why are Hispanics and Native Americans paying such a terrible price? Why are they so much more vulnerable to obesity and its cruel effects than the general American population? And what caused their health to decline so drastically in just a couple of generations—practically overnight? The answers lie in their genes and in their lifestyles past and present. "Here we are dealing with practical applications of physical anthropology and cultural anthropology," says Marshall—with additional complications thrown in by the U.S. government. This is a problem whose origins go back many thousands of years and whose terrible consequences are staring us in the face today.

Enter the hypothesis of the Thrifty Gene

Several researchers have independently noted that populations suffering the highest incidence of NIDDM trace their roots to migration from Asia, either over the Bering ice bridge to the Western Hemisphere (Native Americans) or over water (Australians, Hawaiians, and Nauruans). In 1962 James V. Neel proposed the theory of the thrifty genotype. Suppose, he suggested, the founding stock of these migrations, Asian hunter-gatherers, developed over time an enhanced ability to store calories in times of plenty as fat that would carry them through periods of famine. Such a genetic development would give them a distinct competitive advantage. This is Darwin's classic struggle for survival played according to the rules of natural selection, where the winner's genes are passed on to posterity and the loser's are

Marshall (*center*) with the teachers who attended the 2004 6-week training course at UTHSCSA. (The 16th member was unable to appear when this photo was taken.) The course for half the group was funded by Positively Aging®, for the other half by the National Heart, Lung, and Blood Institute.

condemned to oblivion—an unyielding principle that can be paraphrased as "Last one in the breeding pool is a rotten egg!" The mechanism that enabled their bodies to increase the storage of fat, Neel proposed, may have been increased production of insulin in response to food.

Later, Neel and others realized that his Thrifty Gene theory was too simple. What was lacking was the environmental factor, namely physical activity. Frank W. Booth proposed that the genetic makeup of those Asian forebears evolved over many generations to support a lifestyle that would have included strenuous activity associated with hunting, gathering, and relocating campsites.

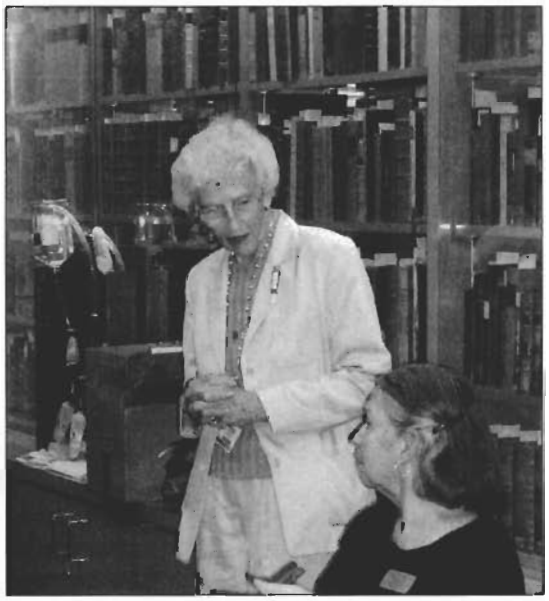
In 1978 Lawrence J. Mandarino found that Pimas had an increased ability to synthesize fatty acids from glucose and store them in adipose tissues, consistent with the Thrifty Gene theory. The Pima are Amerindian stock. According to the landmark report by Greenberg, Turner, and Zegura in 1986, the Amerind, Na-Dene, and Aleut-Eskimo were the principal migrations from Asia across the Bering Strait; since linguistic evidence puts the center of the Amerindian population farthest south and finds the greatest internal differences, the authors concluded that the Amerind migration was the earliest.

Evidence is mounting that Amerindians carried the hypothesized Thrifty Gene to the New World, where over thousands of years Pimas and other descendants intermixed with Hispanics and Mexican Americans, thus distributing their genetic constituents, including the Thrifty Gene. Marshall writes that "preliminary results from researchers in diabetes mellitus at [UTHSCSA] indicated a much greater risk for Mexican Americans with Pima admixture than for Anglos." S. H. Raboudi and fellow researchers in 1989 found that resistance to insulin varied within mixed populations along apparent ethnic lines and was most pronounced in Mexican Americans, who are primarily admixed with the Pima. In their genetic examinations of *A, B,* and *C* alleles conducted in the San Antonio Heart Study among Mexican Americans and non-Hispanic whites, the *C* allele was only found in Mexican Americans. "The *C* allele has thus far been detected only in Pima Indians and Mexican Americans," Marshall writes, "two high-risk populations for diabetes that share Native American ancestry." Furthermore, the *C* allele, which is found in 34 percent of Pimas, appears in 17.7 percent of Mexican Americans; this frequency is compatible with the Native American admixture of 15–45 percent reported for the Mexican American population.

Victims of the New World Syndrome

For thousands of years the descendants of Amerind immigrants adjusted to a new landscape that was changing with the end of the Ice Age. With the disappearance of megamammals, hunters took smaller animals; gatherers continued to supplement their diet with available plant species. As the climate in the Southwest became increasingly hot and arid, the people of agriculture-based prehistoric cultures, whose domain extended over most of Arizona, New Mexico, and Utah, and parts of Colorado, California, Nevada, and Sonora and Chihuahua in Mexico, continued to benefit from their genetically endowed ability to store excess calories as fat to see them through periods of drought and famine.

The incidence of diabetes was fairly equal worldwide, Marshall tells us, until the end of the 1930s. That was when minorities in the Southwest abandoned their physically active lifestyles and became sedentary. And they also abandoned their traditional diets. The Tohono O'odham, for example, were once known as the Papago (literally, "bean eaters") because the staple of their cultural diet was the tepary bean, a plant native to Arizona and Mexico; they changed the name of their tribe because they thought the name was belittling. "Little did they know that the beans were actually essential to their survival," Marshall remarks. We started to see the rise of diabetes in the U.S. at the beginning of World War II, when the food industry started producing processed foods on a gargantuan scale. At this same time the government initiated food subsidies. Where did they go? Says Marshall, "Mostly to pueblos and Indian reservations. What were those foods? Tins of lard. I mean *buckets* of lard," she emphasizes, "meat packed in lard, cheese, and starches. We were sending them everything they didn't need." She adds bitterly, "And we still do. That same kind of food goes to senior centers, to WICs [Women with Infant Children programs], you name it. That is what our federal government is doing to us."



Marshall (*standing*) confers with Jackie Mace, a member of the staff of Texas State Representative Frank Corte, one of a party of legislative visitors who observed and listened to the teachers as they reported on their 6-week training. To a person, the teachers reported that their experiences at UTHSCSA had changed their lives and that they had been given the knowledge and tools to do the same for their students. The UTHSCSA programs have been funded entirely by the federal government, and now Marshall and her colleagues are campaigning for state funds. They are also offering their services as consultants to the Texas Education Association to educate teachers about the epidemic of obesity and diabetes among schoolchildren.

The genetic predisposition of Amerindian descendants to store calories as fat is no longer a competitive advantage. It has become a curse.

Weiss, Farrell, and Hanis in 1984 called this proliferation of metabolic diseases among susceptible Amerindian genotypes the New World Syndrome. It is distinct from the unhealthy phenomenon known as Westernization, the tendency of most newcomers to our land of junk food and giant portions to add weight. Marshall notes that Japanese, who typically eat quite sensibly, put on weight when they immigrate even to Hawaii. The reason Europeans aren't experiencing metabolic disorders on the scale seen in the U.S. is because they didn't stop eating grains and herbs and start wolfing cheeseburgers. "That's what's happening now," she says, "and that's why these changes are occurring over just a few years instead of over thousands of years."

The long road back to health

There are Pima and Zuni living today who can remember when their people enjoyed good health and lived long lives, and some members have taken the first steps toward emulating the lifestyle of their ancestors. Marshall recounts success stories told by John Willoughby in 1991,

> of Pima diabetics who have switched to a traditional diet including tepary beans, mesquite, cholla buds, prickly pear, and chaparral tea, and who have increased their levels of physical activity. Earl Ray is a case in point; at 5-feet 6-inches, 239 pounds, and living on a fast food diet, he suffered from severe diabetes. When he switched to the traditional diet mentioned above, his weight gradually dropped to 150 pounds and his diabetes is under control. Pima activist Adrian Hendricks . . . lives on the old, traditional low-fat, high-carbohydrate Pima diet that includes squashes, tepary beans, corn, melons, and sunflower seeds. He weighs 120 pounds and is also a long-distance desert runner, an activity in keeping with his cultural heritage.

Success is also reported in Hawaii. Dr. Shintani describes the Waianae Diet Program, which includes only traditional foods:

> Native Hawaiians may eat as much taro, poi, sweet potato, greens, seaweed, breadfruit, and other fruit as they desire and up to 198 grams of fish or chicken a day. The food is eaten raw or steamed, as was done in the 1700s before Hawaiians had any contact with the West. This traditional diet is extremely low in fat, rich in fiber and complex carbohydrates, and moderate in protein.

CBS News Correspondent Mabrey tells of the St. Peter Indian Mission School and its principal, Sister Martha Mary Carpenter, who has initiated a program of exercise and diet to protect her 200 students, many of whom are overweight and at risk. As soon as kids get off the bus in the morning, they run. "We just kick that metabolism in," says Sister Martha. She also got permission to alter the federal school lunch guidelines, which require a specified portion of carbohydrates that would make her students "blimp out." A typical lunch at St. Peter includes ham, potatoes, green beans, watermelon, and fat-free milk. Sugar is totally absent. The result? "None of our children are diabetic," she boasts. "None."

The Zuni Diabetes Project, initiated in 1983, achieved encouraging reductions in blood sugar level and body weight among sufferers of NIDDM. Marshall believes it was successful because organizers sponsored *community-based* exercise programs and weight-loss competitions and thus made it possible for the Zuni to reclaim their ancestry. An attempt to impose dietary and exercise programs from outside would probably have failed.

Most school districts in the Southwest have become alert to the threat posed to their students by obesity and metabolic diseases. Until just a few years ago, Marshall notes, NIDDM was considered an adult affliction and pediatricians didn't check for symptoms in children. Unfortunately, since retinopathy is one of the first consequences of NIDDM, many children suffered permanent eye damage. "Now," she says, "we're playing catch up and training pediatricians to look for signs of type 2 diabetes." Physicians now also have a more reliable test for diabetes than the traditional fasting glucose test; called the A1C test, it reveals the average blood glucose level over the previous several weeks, rather than the previous 24 hours. Teachers and school nurses are also trained to look for AN (Acanthosis Nigricans), a skin condition associated with hyperinsulinemia and insulin resistance and therefore a risk factor for NIDDM. It appears as a dark pimply, scabby ring around the necks of children, especially boys. (Before today's heightened awareness of diabetes, says Marshall, the condition probably would have elicited a scolding by a child's mother or teacher—Why didn't you wash your neck before you came?)

The program at UTHSCSA

Marshall and her colleagues at Positively Aging® likewise are carrying the fight to the classroom. Their target is middle school students. Marshall admits realistically that "in middle school (grades 6–8) in this part of the country, that's just about the last time you really have the attention of the students before all the hormones kick in."

Teachers from middle schools and high schools are brought onto the UTHSCSA campus every summer. This summer 16 teachers from 14 minority schools in 6 districts were selected to work and learn with research faculty, then to write curricular units in their fields—science, math, and language arts. Teachers are divided into six groups, each dealing with a particular subset of health issues. One group concentrates on the cardiovascular system, including blood and the blood supply; another on sleep and sleep disorders (obesity and other complications can interfere with sleep, thereby inviting other health problems); diabetes, including heart disease and stroke; aging and mobility, including disease states that impair mobility; mobility and obesity emphasize concepts of forces and motion, since the body systems—lungs, kidneys, and heart—are closed systems that operate according to well-defined principles of physics; the pulmonary system, including issues of nutrition in addition to lung function.

UTHSCSA is one of few organizations in the country that train teachers to protect students' health, and the only one funded by scientific education partnership groups that educates teachers under the tutelage of researchers. Its Web site **http://teachhealthk-12.uthscsa.edu/pa/posageabout-overview.htm** posts sample copyright-free curricular units, complete with handouts and worksheets, that are available for downloading. The 12 units cover a full range of health issues from aging and nutrition to diabetes and oral health, and they all meet national, state, and district standards. "There are thousands of pieces of curriculum sitting on shelves that were put together with federal funding," Marshall laments. She and her colleagues want theirs put to use.

A results-oriented teacher

Dr. Marshall is a remarkable educator with both feet planted firmly on the ground. Equally remarkable is the story of how she got caught up in the war against obesity and diabetes. In 1986 she accompanied her husband, Dr. Tom Marshall, a professor of Restorative Dentistry at the UTHSCSA Dental School who is also trained in forensic science, on an archaeological dig at Río Azul in Guatemala. Prehistoric human remains were shipped to TAMU for evaluation by D. Gentry Steele, professor (now emeritus) of Anthropology. Marshall, who at the time held a master's in Public Health, confesses that "after being in Guatemala and then meeting Gentry, by the next year I was in a doctoral program."

Her dissertation wasn't the typical bound sheaf of papers. Instead, it was a series of seven video novellas, each 15 minutes long, that discussed risk factors and demonstrated self care associated with diabetes. Narrated in English and Spanish, the series was targeted to the population of south Texas, many of whom can't read. An integral part of her dissertation investigated how the series was used and its practical effects. "One of the things we found," she reflects, "was that you aren't going to change the habits of mothers or grandmothers for their own cooking; what they are interested in is what they can do to improve the life and health of the children and grandchildren. They showed great interest in the content of the series."

A measure of the practical value of her series is that it is still used all over the United States. Recently the Massachusetts Department of Public Health found it useful for educating Puerto Ricans and Cubans because it communicates in very simple, easy-to-understand Spanish. Marshall gives credit to Dr. Steele for the success of the series; as a member of her doctoral committee, Steele, as she puts it, "really went out on a limb."

The practical side of education, the application of principles—that's what matters to Carolyn Marshall. What could be more practical than saving the health—and lives—of a generation of human beings?

–JMC

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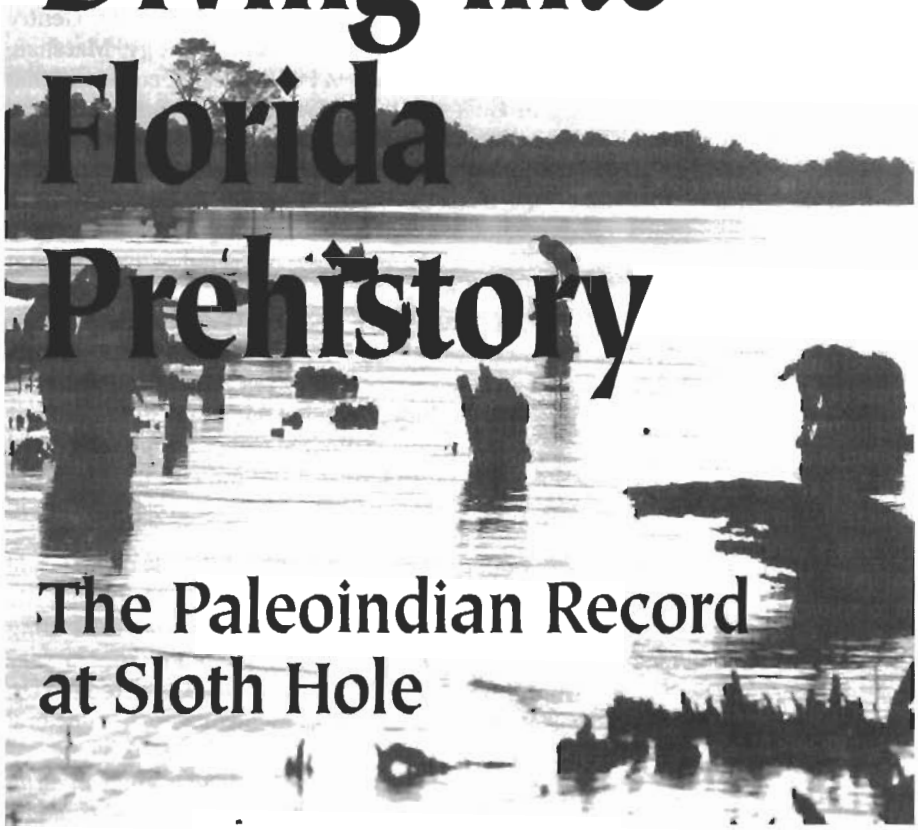
Suggested Readings

American Diabetes Association Web site www.diabetes.org/about-diabetes.jsp

CBS News Online. Why Is America So Fat? Web site www.cbsnews.com/stories/2004/07/12/60II/main628877.shtml

Greenberg, J. H., C. G. Turner, and S. L. Zegura 1986 The Settlement of the Americas: A Comparison of the Lingustic, Dental and Genetic Evidence. *Current Anthropology* 27:477–497.

Diving into Florida Prehistory



The Paleoindian Record at Sloth Hole

AT 33 FT DEEP, Sloth Hole is more than just a deep hollow in the middle of the Aucilla River. Since its discovery in the 1960s, Sloth Hole has been a rich data mine for paleontologists and archaeologists, far surpassing similar sites that dot the course of this unusual river. Running from northeast to southwest in central Florida, at the join between the peninsular and panhandle portions of the state, the Aucilla is partially landlocked; in its southern half, the river sometimes disappears underground, flowing through a network of siphons, springs, and other karst topography features before reappearing at the surface and continuing on its meandering way to the Gulf of Mexico.

A submarine mother lode

Today, Sloth Hole, completely inundated, is one of the deeper sinkholes in the Aucilla River system. Several springs feed in from the bottom of the sinkhole, and it's bracketed by shallow limestone shoals on both the upstream and downstream ends of the sinkhole proper. But Sloth Hole wasn't always in the middle of a river. There's compelling evidence that the site originated as a spring-fed pond at the bottom of one of the many karst holes pockmarking the area and has undergone repeated inundations over the past several dozen millennia. "We have wonderful evidence it was dry land once," says C. Andrew Hemmings, who has been studying the site for 10 years. "In 18 feet of water, we have an in situ palm stump."

The palm stump has twice been dated to approximately 32,000 RCYBP. Additional evidence points toward surface exposure of this portion of the site at about 26,000 RCYBP and 12,300–14,000 RCYBP as well. During those periods, its depth would have been much reduced, to about 10 ft deep; it would have been a half-filled hole in the ground. But after about 12,300 years ago, modern conditions prevailed. "Nowadays you can take a boat from Sloth Hole to Tampa," says Dr. Hemmings. "It goes straight out to the Gulf. In Clovis times, the shoreline was 150 kilometers away, maybe more."

The first investigations

Sloth Hole first came to scientific notice through the efforts of Stanley Olson, the prominent zoologist, and Dr. Richard Ohmes, a student of Carl Jung. Over several decades, Olson and Ohmes collected a large amount of faunal material from the Aucilla and a neighboring river, the Wacissa. Although he was most interested in adding ivory artifacts to his collection, Ohmes also attempted to take soil cores from the hard-packed sediments at the bottom of the sinkhole. Unfortunately, he found that his cores, obtained after a great deal of difficulty, "were, as [he] expected, useless."

Meanwhile, other scientists, including herpetologist Bruce Means and paleontologist David Gillette, were examining the Sloth Hole faunal material from a paleontological perspective. It was through their efforts that the site first came into prominence—as the type-site for *Felis amnicola*, a long-extinct species of wild cat once endemic to Texas, Florida, Georgia, and Mississippi. Indeed, specimens of 27 extinct Pleistocene species are known from Sloth Hole, including horse, camelids, mastodons, mammoths, and (not surprising) sloths, along with the remains of still-extant species like whitetail deer, lynx, and turtle. Some of these bones had been worked into tools, and a few bear unambiguous evidence of butchering. One find, a lynx mandible dating from the Archaic period, has three spiral motifs carved on each side. A fragment of turtle carapace bears a similar design.

Several years ago, just prior to his death, Ohmes donated his collections to the Florida Museum of Natural History in Gainesville. Among the dozens of mammoth teeth, mandibles, and similar pieces were numerous worked ivory artifacts, including a complete ivory shaft with an incised zigzag pattern on both sides. This piece, which was clearly made while the

ivory was fresh, has been called "the oldest artwork in North America." It may have served as a lunar calendar. Interestingly, it was found in two pieces—five years apart.

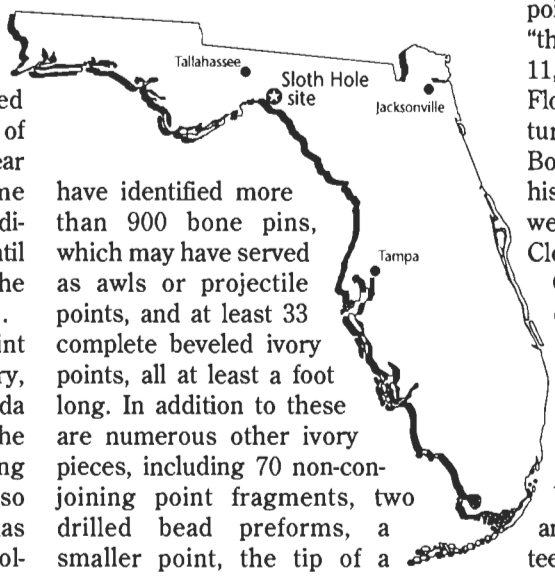
The Aucilla River Prehistory Project

Ohmes and the other early investigators stuck to mining the fine-grained organic-rich sediments at the bottom of the site, and for this reason it's unclear today exactly where their finds came from. They seldom dug into intact sediments; real excavations didn't occur until Sloth Hole came to the attention of the Aucilla River Prehistory Project (ARPP).

The ARPP began in 1983 as a joint project of the Florida of Natural History, the University of Florida, and the Florida Bureau of Archaeological Research. The project, which has amassed astonishing amounts of data on the past 12,000 or so years of occupation on the Aucilla, has attracted dozens of researchers and volunteers, most of whom are professional-grade divers. One of them was Andy Hemmings. Hemmings first began working at Sloth Hole as a graduate student in 1994, when he surveyed the site to see if anything was left intact. Fortunately, aside from surface disturbances, the site seemed mostly unharmed. Formal excavations began shortly thereafter under the egis of the ARPP, and continued until 1999.

The sediments at Sloth Hole turned out to be substantial. Several meters of modern fluvial material (Stratum I) make up the topmost sediments; beneath this are 10 layers of semi-compacted peat, leaves, and cross-bedded sands that overlie a red organic clay dating to more than 41,980 RCYBP. Additional radiocarbon dates reveal that the deposits below Stratum I span a period from at least 43,000 RCYBP to 1200 RCYBP. The cultural material in the deeper parts of the site is suspended in fine-grained sand layers younger than 12,300 years old.

Hemmings and his associates have recovered thousands of artifacts from Sloth Hole, most made of perishable materials and many demonstrably Paleoindian in age. The assemblage is enough to make any First Americans researcher drool; in fact, Sloth Hole may well boast the largest assemblage of Paleoindian bone and ivory tools in North America. Among other objects, the researchers have identified more than 900 bone pins, which may have served as awls or projectile points, and at least 33 complete beveled ivory points, all at least a foot long. In addition to these are numerous other ivory pieces, including 70 non-conjoining point fragments, two drilled bead preforms, a smaller point, the tip of a needle, and a fragment of a socketed handle. The only unstained ivory tool fragment found in situ has been directly dated to 11,050 ± 50 RCYBP; currently, Hemmings and geoarchaeologist Mike Waters of TAMU, associate director of **CSFA,** are working on dating about a dozen more bone and ivory tools, including a deer metacarpal flute and an *Equus* metatarsal dagger.



Hemmings was surprised at the number and diversity of ivory tools found at the site, and he believes every single one is Clovis in origin. "They were probably collecting the ivory fresh, possibly from their kills, not mining fossil material," he points out. Furthermore, he believes that "the guillotine came down pretty hard at 11,000 RCYBP for the proboscideans in Florida. I don't think any of the later cultures, like Suwannee, Simpson, and Bolen, ever saw any proboscideans." If his theory is correct, the ivory craftsmen were almost certainly Clovis or pre-Clovis.

Other organic remains include mastodon and mammoth skeletal material, uncountable slivers of shattered ivory, and the butchered limb of a Pleistocene camelid, *Palaeolama*—a metatarsal that appears to have been chopped apart when a prehistoric butcher was separating bones in the animal's lower limbs. Two *Palaeolama* teeth were also recovered. *Palaeolama* remains, although rare in archaeological contexts, have been associated with Paleoindian sites elsewhere, including Blackwater Draw in New Mexico.

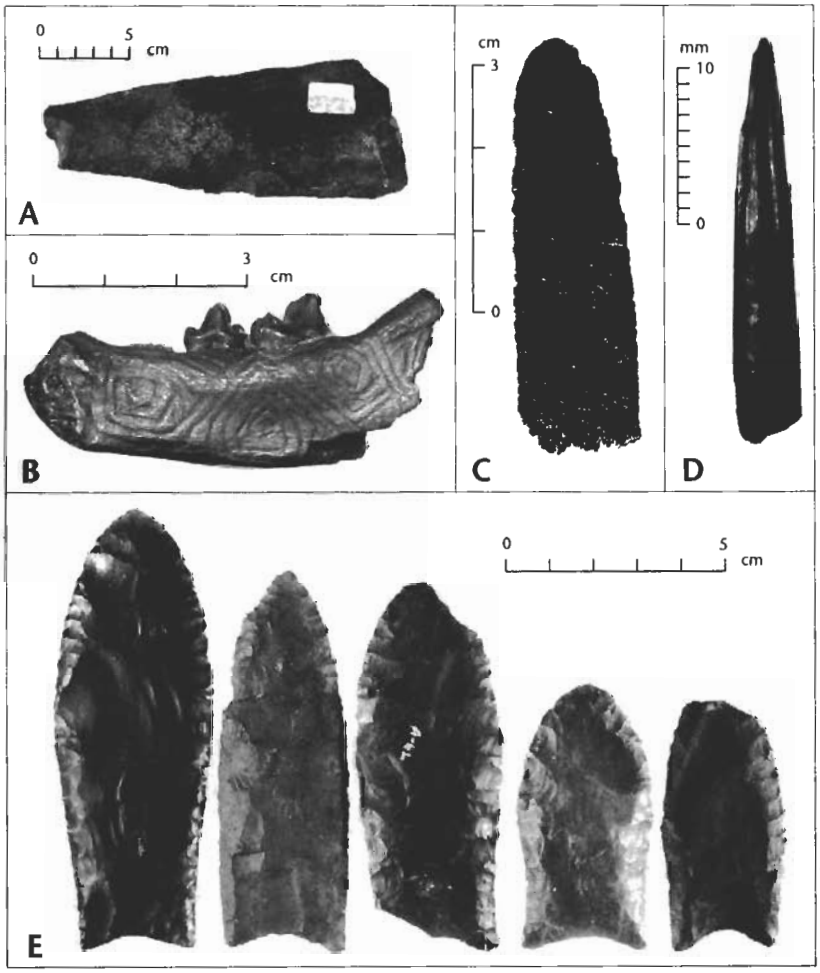
The organic remains are strong evidence of human presence, but it's the stone tools that clinch the deal. Thus far, two early cultures are represented: Clovis (11,000–12,000 RCYBP), and the Bolen culture (about 10,000 RCYBP), which straddles the late-Paleoindian/early-Archaic divide. Professional archaeologists have recovered 17 Bolen points and 6 Clovis points, and collectors are known to have been taken

Hemmings (*right*) with Michael Faught in 1997 at the open house of the Aucilla River Prehistory Project. Dr. Faught (MT 18-4, "Rethinking Clovis Origins") is being awarded the prototype of his invention, the Faught-o-lator, which he intended to fit on the end of a 6-inch induction dredge hose and assist a diver in cutting through hard sediments underwater. Unfortunately, the invention never quite lived up to his expectations.

other Clovis points. Also recovered were bifacial cores, a few preforms, portions of late-stage bifaces, and various overshot flakes and utilized blade flakes. Much of the material was quarried at nearby Fossil Hole (8JE1497), a massive inundated lithic site at the southern tip of Ward Island less than a mile away. According to Hemmings, most of the Sloth Hole lithics, especially the projectile points, are "beat to death—exhausted."

Stones and bones

These observations have led Hemmings to an intriguing conclusion: that the Clovis occupants at least, and likely the Bolen occupants as well, were pursuing a vigorous bone tool industry at Sloth Hole. In fact, he's confident that he and his colleagues have found an ivory workstation. It's hard to argue with the facts: in an area roughly 3 m square, 9 splinters or fragments of finished tools and *4,000* slivers of chopped-up ivory were found in association with 2 Clovis points, 2 heavily battered bifaces that may be unrecognizable Clovis points, and some 20 overshot flakes removed from bifacial cores and used as unifacial tools. Some of the ivory pieces retain what appear to be "chatter marks," created when ivory is deliberately split apart. Hemmings agrees that the Clovis points probably started life as projectile points; he theorizes, however, that the Sloth Hole people, while creating new stone and ivory tools, were also using up worn-out stone tools.



Artifacts recovered from Sloth Hole: A, flaked proboscidean long bone fragment; B, incised *Lynx rufus* mandible, probably Archaic in age; C, ivory haft dated 11,050 ± 50 RCYBP; D, ivory needle tip; E, Clovis points.

Some of the bone pins collected from the site are almost certainly Clovis in age. "My take on the bone pins is this," Hemmings explains. "We have 17 Bolen points and 6 clear Clovis points. If we took that ratio, that would mean that 300 of the bone pins are Clovis. I don't think it's that high, but I think that at least 10 percent of the tools are Clovis. And even if it's only 5 percent, that's 45 bone tools—more Clovis bone tools than are known for the entire rest of the continent." What's more, Hemmings has so far identified 10 to 12 deer bone tools that are made in the same way as the ivory tools, and are almost certainly Clovis in origin.

Hemmings is quick to point out that Sloth Hole is *not* an atypical Clovis site; the only reason so many ivory and bone tools have been found here, he argues, is because of the excellent preservation. He believes this level of ivory and bone use was not at all unusual for Clovis peoples. "I want to hammer this point home," he declares. "We fundamentally misunderstand sites that don't have good organic preservation. We shouldn't get too wrapped up in the individual trees and fail to see the forest here."

Despite the impressive amount of material Hemmings and the ARPP have recovered, Sloth Hole still has a great deal to teach us. Only a relatively small portion of the site has been formally excavated, and untold amounts of faunal material remain at the bottom of the Aucilla. Hemmings, for one, expects his attention to remain focused on Sloth Hole for some time to come. "I owe the world a site report, and I think I need to do some more work there before I move on," he says. "There's plenty still to be learned. There's no 'use-by date' on good data—like the preservation at the bottom of the Aucilla, it remains good forever."

–Floyd B. Largent, Jr.

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Suggested Readings

Dunbar, J. S., C. A. Hemmings, P. K. Vojnovski, S. D. Webb, and W. M. Stanton in press The Ryan/Harley Site, 8Je1004: A Suwannee Point Site in the Wacissa River, North Florida. In *Paleoamerican Origins: Moving Beyond Clovis*, ed. R. Bonnichsen, B. Lepper, D. G. Steele, D. Stanford, C. N. Warren, and R. Gruhn. Texas A&M University Press, College Station, pp. 73–87.